

## DESCRIPTION OF LESLEY'S MICROMETER FOR FIELD-NOTE PLOTTING.

(Read before the American Philosophical Society, April 18, 1873.)

I desire to place on record in the Proceedings of the Society a description of my Micrometer for plotting field-notes, which appears to be coming into favor with Civil and Mining Engineers.

It was many years ago that the need of such a little instrument forced itself on my attention, as a substitute for a vernier attachment to a scale for use on the office-table. The strain upon the eyes in constant plotting on small scales, say on the common scale of 1000 feet to the inch, or the not uncommon one of 2000, is greater than the best human organs of vision can endure without permanent injury; to say nothing of the loss of time involved in adjusting the dividers, or applying the paper edge, if a paper scale be used directly. Every field worker who has constructed elaborate contour line maps covering an extensive region of country will bear me out in this assertion.

Considering also the liability to error in counting the decimals and hundredths or thousandths of the scale-unit of *distances*, after hours of application to work has lowered the tone of the nervous system, I sought some mechanical substitute analogous to Mr. Cleaver's Protractor, now in almost universal use for plotting *courses* with ease and precision.

Many forms of such an instrument passed through my mind; but over occupation, or perhaps laziness, prevented me from taking the necessary steps to realize the idea in even tentative forms, although I spoke of it several times to Mr. Young, the accomplished and experienced instrument-maker of Philadelphia, now dead.

During my wanderings in Europe in search of health in 1866, '67 and '68, I was several times the guest of my old friend and fellow-laborer in the Anthracite coalfields (1853), Prof. Edouard Desor, at his charming residences on the Combe Varin and in Neufchâtel, Switzerland. One day we strolled into the well-known philosophical instrument manufactory of Mr. Hipp, to whom, among other things, I mentioned the need of a Micrometer Divider for plotting, and drew at his request three of its possible forms, such as seemed to me the most feasible, giving him an order for one, and leaving him to select the form he preferred.

On my return to Philadelphia in the spring of 1868 I received it in a broken condition. The chain had been snapped by some custom-house official, too curious to learn its nature to treat it with much delicacy of handling. It was however easily repaired, and I found it all I could desire: handy, accurate in its action, and perfectly relieving the eyes from the strain of measuring. It was much admired by my professional

acquaintances, but remained a solitary specimen until Mr. Kerr, State Geologist of North Carolina, begged permission to have it copied at Mr. Young's (Jr.) establishment. This was in the winter of 1871, '72. I have since been informed by Mr. Kerr that his order was never filled; at least, he never received his Micrometer. The original was in constant use by one of my assistants in my office throughout the spring and summer of 1872. When the course of instruction in the new Department of Science of the University of Pennsylvania commenced last fall I accustomed my special geological students to use this instrument among others, and ordered of Heller & Brightly, instrument-makers, a duplicate of it, set however not to centimeters and millimeters, but to inches and hundredths of an inch. While making it, Mr. Eckley Coxe and other civil and mining engineers saw it, and ordered others like it for their own use, and these orders have become so numerous that it has evidently taken its place among the accepted apparatus of the engineer's office-table. I hope many will in future enjoy the relief and comfort from it which I have enjoyed since 1868.

I was urged to patent it, as Mr. Cleaver patented his Protractor. But I feel a natural prejudice against patenting a little thing which may become to some extent a public benefit, at all events within the not altogether narrow limits of one of the scientific professions. I desire, however, to prevent any one else from hampering its progress by a patent, and to that end beg leave to place this record of its invention among the Proceedings of this Society. Any one can obtain the instrument free of patent royalty, from the makers above named, or may order it made for themselves anywhere else.

This Micrometer consists of an arc set with three, four or more needle-points fixed at intervals of one centimeter, one-half inch, or any other unit adopted for the survey, equivalent say to 100 feet (yards, links, rods, &c).

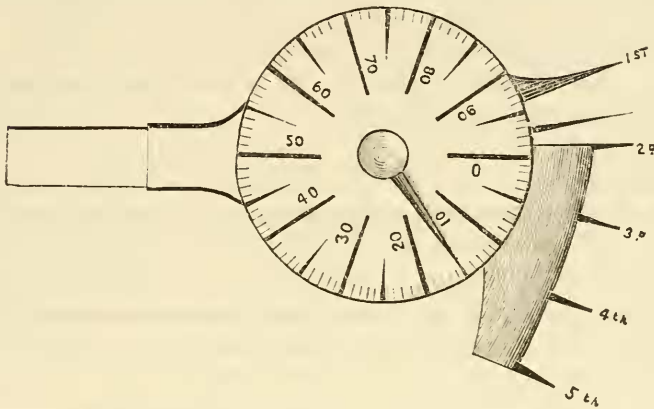
A handle projects upward from the inside of the arc by which to hold it, and by which it may be applied to the line of course and be gently rotated, so that each needle-point in its turn pricks its (100 feet) unit distance along the line.

Between the last two needle-points floats a supernumerary needle-point or compass-leg, jointed high up on the handle, and swung or floated to and fro by a simple ratchet and watch chain, turned at will by means of a button, projecting from the centre of a circular disc on the handle; the disc circle being divided into hundredths (thousandths, &c.,) and traversed by an index which starts from and comes round to a stop at zero.

While the index travels over the disc from 0 to 100 the supernumerary needle-point travels from needle-point to needle-point, one unit.

Example of use: Suppose a distance 327 feet to be laid off on a course; the fifth needle is applied to the station (point of tangent, or point of curve) and the arc rotated, so that the fourth needle pricks 100,

the third 200, the second 300 feet. Then, the index being brought to 27, the floating needle pricks 327. See woodcut, Fig.



Mr. Eckley Coxe has had a useful addition made to his instruments in the shape of a set of removable rings, divided for 100ths, 1000ths, 66ths, 33rds, &c., &c. Two little screws hold the ring in place, whichever one may be in request for any particular plotting. When plotting on the scale of some other unit of distance is required another ring is substituted.

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*Stated Meeting, May 2d, 1873.*

Present, 14 members.

Prof. CHASE in the Chair.

Letters accepting membership in the Society were received from Henry W. Acland, dated Radcliffe Library Museum, Oxford, England, April 10th, 1873; James Ed. Oliver, dated Cornell University, Ithaca, N. Y., April 21, 1873; John Fulton, dated Saxton, Bedford Co., Pa., April 21, 1873, and Theo. D. Rand, dated 17 South Third Street, Philad'a, May 1, 1873.

Letters of Envoy were received from the Physical Observatory, St. Petersburg, March, 1873; the Austrian Geographical Society, Vienna, Jan. 3, 1873; Prof. G. L. Vose, per S.